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FOR
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OF
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PROJECT NO. F 268 (7)

PREPARED BY
MONTANA STATE HIGHWAY COMMISSION
PRECONSTRUCTION DIVISION
AUGUST, 1971

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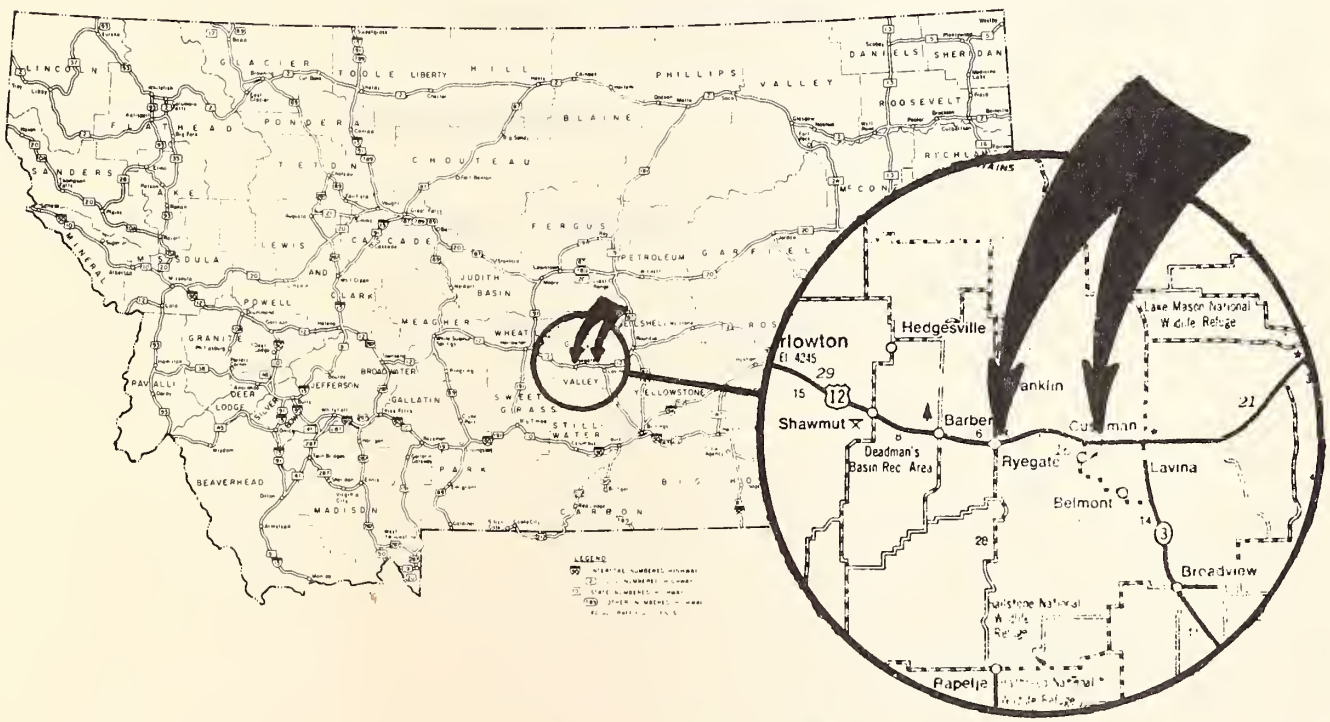
RYEGATE
EAST



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INTRODUCTION

This report contains the results of a route study for comparison of alternate lines on Project F 268(7), Ryegate-East, in Golden Valley County, Montana.

Section I., Summary and Analysis contains conclusions, recommendations, and a discussion of the advantages and disadvantages of the four alternates.

Section II., Narrative Report contains descriptions of the alternates, and discussions on the type of facility, social, economic, and environmental effects of the project, and additional features of the project.

Section III., Public Hearing Comments,

Section IV., Related Studies and Reports, and

Section V., Exhibits provide further information on the project.

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I. SUMMARY AND ANALYSIS

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CONCLUSIONS AND RECOMMENDATIONS

Alternate No. 1 is the recommended location for this project because it has the lowest total annual cost, provides the highest quality road, and provides suitable service for all road users without adding to the road system that has to be maintained, reconstructed, or operated upon.

ADVANTAGES AND DISADVANTAGES OF ALTERNATES

Alternate No. 1 Advantages:

1. Alignment is already established along the major part of the route.
2. Minimal additional scar to countryside as large amounts of cuts and fills have already been made along the present highway.
3. Slopes already stabilized in highly erosive soil area.
4. Portions of this alternate will require borrow material, allowing selection of proper materials, whereas other alternates are balanced jobs in expansive soil areas.
5. Right-of-Way take would be minimal.
6. Good access and service to people in the immediate area.
7. Takes advantage of flat terrain along river.
8. Lowest total annual cost.
9. Lowest maintenance cost.
10. Second lowest operating cost.
11. Most scenic route.
12. Route favored by most local people.
13. Least amount of restricted passing zones.

Alternate No. 1 Disadvantages:

1. The east end of the alternate passes through two areas of rock cut. This alignment is necessary as the railroad track on the south is too close to allow a line shift to the right.
2. As the existing railroad underpass cannot be widened, a new structure would have to be built at some time, which is the big factor in the cost of this alternate.

3. Potential channel erosion problems from Musselshell River.
4. Second highest construction cost.

Alternate No. 2 Advantages:

1. Alignment is already established on about 50 percent of the route.
2. Less additional scar to countryside than Alternates No. 3 or 4.
3. Slopes already established in erosive soil area along approximately 50 percent of the route.
4. Less right-of-way take than Alternates No. 3 or 4.
5. Less drainage costs than Alternate No. 1 as Alternate No. 2 is located nearer to the origin of the drainages.
6. Good traffic service during construction.
7. Lowest operating cost.
8. Second lowest maintenance cost.
9. Shortest route.

Alternate No. 2 Disadvantages:

1. Rougher country in general.
2. Little benefit to families living along the river.
3. Portion of present highway not on alternate must be maintained in addition to new portion.
4. Highest construction cost.
5. Severs stock access to watering facilities.
6. More scar to countryside than present highway.
7. Passing is restricted more than for Alternate No. 1.

Alternate No. 3 Advantages:

1. Smaller size or fewer culverts on drainages.
2. Excellent traffic maintenance during construction.
3. No problems with river meandering.

4. Second lowest construction cost.

Alternate No. 3 Disadvantages:

1. Rough country.
2. Very little benefit to families along the river.
3. Portion of present highway not on alternate must be maintained in addition to new portion.
4. Second highest maintenance cost.
5. Second highest operating cost.
6. Highest total cost.
7. Scars countryside more than Alternates No. 1 or 2.
8. Severs stock access to watering facilities.
9. Greatest amount of restriction to passing.

Alternate No. 4 Advantages:

1. Least drainage costs of all alternates.
2. Good traffic service during construction.
3. No problems with river meandering.
4. Lowest construction cost.

Alternate No. 4 Disadvantages:

1. Rough country
2. Least benefit of all alternates to families along the river.
3. Portion of present highway not on alternate must be maintained in addition to new portion.
4. Highest maintenance cost.
5. Highest operating cost.
6. Second highest total cost.
7. Results in more scars to countryside than any other alternate.
8. Severs stock access to watering facilities.
9. Passing is restricted over a great portion of this route.

HIGHWAY JOINT DEVELOPMENT COUNCIL COMMENTS

This project was presented at the fifth meeting of the Highway Joint Development Council held June 10, 1970.

At this meeting, a communication from the Lower Musselshell Soil Conservation District was read.

The Board of Supervisors of this agency were in favor of routing the project "through the upland", rather than along the river valley. Three alternates, Alternates No. 2,3, and 4 through the "upland" were studied. Design features such as soil and drainage conditions in the area, right-of-way, access, erosion control, and multiple-use such as stockpasses were mentioned in the District's communication. Each of these features was given consideration in the study of the project. The Conservation District also mentioned a proposed State Water Resources Board - Montana Highway Commission cooperative development of a dam at Careless Creek. A representative of the Council of Natural Resources and Development, speaking on behalf of the Water Resources Board, stated that plans to develop plans for a dam on Careless Creek have been abandoned.

II. NARRATIVE REPORT

Project F 268(7) will connect, by some route, a point just east of Ryegate, with a point on US 12 approximately four miles west of Lavina. Stage construction will be employed on this project. Stage 1 will have a 34-foot paved surface and a subgrade to accommodate a 40 foot roadway in the Stage II construction. The first 6.2 miles of this project will be built under this first stage programming.

Within the 1.5 mile wide corridor four alternates were studied and are described as follows:

DESCRIPTIONS OF ALTERNATES

(1) Alternate No. 1 would follow generally along the present highway , ... in the river valley, deviating from it in order to flatten curves, improve alignment, and increase sight distance. The maximum degree of curvature would be approximately 4°30', and maximum grades would be between 3% and 5%. This route, defined by points ABHKLJFM, would have a new railroad underpass at point L, as the existing structure does not meet present-day width and clearance standards. This route would be about 12.18 miles long.

(2) Alternate No. 2, defined by points ABHIJFM, would follow the same route as Alternate No. 1, approximately 5.9 miles to point H where Alternate No. 2 would proceed north of and parallel to the present highway, in an easterly direction. This route, which rejoins Alternate No. 1 at Point J, would have a maximum degree of curvature of approximately 4°30', maximum grades between 3% and 5%, a length of about 12.06 miles, and would involve the construction of a new railroad overpass at point I.

(3) Alternate No. 3, defined by points ABCGEFM, would follow the same route as Alternate No. 1 about 3.56 miles to point B, then proceed northeasterly about 1.6 miles, easterly 1.7 miles to point C, then south and easterly to rejoin Alternates 1 and 2 at point F. Maximum degree of curvature of about 4°30', maximum grades between 3% and 5%, a length of about 12.10 miles, and a railroad overpass at point G characterize this route.

(4) Alternate No. 4, defined by points ABCDEFM, would follow the same route as Alternate No. 3 to point C, then would proceed northeasterly about 2.3 miles, then southeasterly about 2.3 miles to rejoin Alternate No. 3 at Point E. Alternate No. 4 would have maximum degrees of curvature at about 4°30', maximum grades between 3% and 5%, a length of about 12.12 miles, and a railroad overpass at point D.

TYPE OF FACILITY

This project would provide the traveling public with a two-lane, 34 foot roadway with two 12 foot traffic lanes. A 62' foot subgrade will be built to accommodate a 40 foot surface in the second stage construction. The present road is 24 feet wide.

SOCIAL, ECONOMIC, AND ENVIRONMENTAL EFFECTS

The various social, economic and environmental effects were evaluated and a comparative analysis was made for the alternates where applicable.

1. FAST, SAFE, and EFFICIENT TRANSPORTATION

Through the avoidance of steep grades and sharp curves, all of the alternates would provide fast, safe, and efficient transportation for the driving public. All alternates will eliminate a very dangerous sharp curve near Careless Creek. The design speed will be 60 M.P.H..

2. NATIONAL DEFENSE

All of the alternates could be used for military vehicles. Alternate No. 1 is located on flatter terrain than the other alternates which would prove slightly superior for moving heavy equipment.

3. ECONOMIC ACTIVITY

The economic activity of the sourrounding area would not be significantly affected except to provide faster and safer transportation. If an alternate other than Alternate No. 1 is chosen, the existing highway must be preserved and maintained along the segments that are not utilized as part of the route. This would serve the families located in the farming area now served by the existing road, such as along the river between points B and M.

4. EMPLOYMENT

Employment would not be affected in the area. All the alternates would provide safer and faster transportation. There would be little benefit from the new construction for the local people unless a route that follows the existing road is developed.

5. RECREATION AND PARKS

There would be no effect to parks in the area due to any of the alternates and none of the alternates are considered detrimental to the existing or potential recreation features of the region.

6. FIRE PROTECTION

All of the alternates would provide a faster route for firefighting equipment. If the existing route is not reconstructed, fire protection would not be hindered since this road must still be preserved to serve the area.

7. AESTHETICS

The aesthetics of the area will not be severely affected by any of the alternates. By constructing the road along the natural contour of the land, by minimizing deep cuts and fills, and by employing erosion control, adverse aesthetic features will be minimized. Alternate No. 1 could result in better aethetics than the other alternates as it takes advantage of the present highway location along the river valley which has naturally recovered and adjusted to alteration of the landscape. The river frontage, interesting rock formations, and trees provide the highway user with pleasant surroundings along Alternate No. 1 which are not as desirable along the other routes.

8. PUBLIC UTILITIES

There will be no major effect on public utilities on any of the alternates. Portions of Alternates No. 2,3, and 4 are in areas with no utilities along them and Alternate No. 1 and portions of the other alternates along the present highway will not affect most existing utilities which are located far to the right or along the railroad right-of-way. Public utilities, where affected, will be perpetuated.

9. PUBLIC HEALTH AND SAFETY

None of the alternates will affect public health and safety other than by providing safer transportation.

10. RESIDENTIAL AND NEIGHBORHOOD CHARACTER AND LOCATION

As this is a rural project, none of the alternates will affect residential or neighborhood character and location.

11. RELIGIOUS INSTITUTIONS AND PRACTICES

The religious institutions and practices in the area will not be affected by any of the alternates.

12. CONDUCT AND FINANCING OF GOVERNMENT

There will be no appreciable effect on the conduct of government for any of the alternates. Although new right-of-way will have to be purchased, the least amount for Alternate No. 1, no appreciable effect is expected on the local tax base. Preliminary estimates indicate that approximately six to eight acres of irrigated land will have to be purchased along segment AB (all alternates) and an additional two to three acres along segment BHKLJFM (Alternate No. 1 only).

13. CONSERVATION

There is no appreciable difference between the alternates relative to their effects on conservation. Wildlfie and general ecology of the area will not be significantly affected by any of the alternates. Erosion control methods will be employed on cut and fill slopes.

14. NATURAL AND HISTORIC LANDMARKS

Near the beginning of the project on all alternates some old buildings in poor condition exist which have been standing for sometime. Widening of the present highway through this area may affect one or more of these buildings.

15. NOISE,AIR, AND WATER POLLUTION

None of the alternates will have any appreciable effect on noise, air, or water pollution. Temporary and permanent erosion control methods will be employed on the project. Air pollution during construction will be minimized through the use of such methods as scrubbers on hot plants and dust control. Some noise pollution will be present during construction.

16. PROPERTY VALUES

Some benefit to property values should be expected as the result of the new construction and improved service. It could be slightly more favorable to property along alternate routes 2,3, and 4 because of the new access through the area.

17. MULTIPLE USE OF SPACE

Stock underpasses may have to be used on Alternates No. 2,3, and 4, as justified by right-of-way negotiations. The river region along Alternate No.1 is suitable for development of a roadside rest area.

18 REPLACEMENT HOUSING

No replacement housing will be needed for any of the alternates.

19. EDUCATION

Other than providing a safer and improved road for the school bus route, the educational system will not be affected.

20. DISPLACEMENT OF FAMILIES AND BUSINESSES

The displacement of families and businesses will not occur for any one of the alternates.

21. ENGINEERING, RIGHT-OF-WAY, AND CONSTRUCTION COSTS OF THE PROJECT AND RELATED FACILITIES

Engineering, right-of-way and construction costs are different for the various alternates. Preliminary estimates of these costs are as follows:

Alternate No.	Construction Cost	R/W Cost	Utilities Cost	P.E., Const. Engineering, & Engineering	Total Est'd Cost
1	$1,231,059	$16,709	-------	$184,658	$1,432,426
2	1,418,816	24,937	-------	212,822	1,656,575
3	1,195,140	27,769	-------	179,271	1,402,180
4	1,055,545	27,893	-------	158,331	1,241,769

22. MAINTENANCE AND OPERATING COSTS

Maintenance and operating costs for any of the alternates will be similar to other two-lane primary highways in similar terrain.

23. OPERATION AND USE OF EXISTING HIGHWAY FACILITIES AND OTHER TRANSPORTATION FACILITIES DURING CONSTRUCTION AND AFTER COMPLETION

The present highway, U.S. 12, will be used for through traffic for any alternate chosen. The first part of all the alternates (from point A to point B) and the last part of all the alternates (from point F to point M) fall on the present highway so construction and movement of traffic would have to be planned and coordinated in these sections. The section from point B to point H on Alternates No. 1 and 2, the section of Alternate No. 2, JF, and the remaining portion of the present highway on Alternate No. 1, HKLJF, would also require coordination of construction activities and traffic. The portion of Alternate No. 2, HIJ, the portion of Alternate No. 3, BCGEF, and the portion of Alternate No. 4, BCDEF, are not on the present highway which would allow construction without disruption to the traffic.

If Alternate No. 2,3, or 4 is constructed, the unimproved portion of the present highway, U.S. 12, will be used for local traffic.

ADDITIONAL FEATURES

LAND USE

The land to the south of segment AB (all alternates) is mainly utilized as dry crop and irrigated cropland. To the north of segment AB is mainly irrigated cropland or pasture.

Grazing land is on the south and north of segments BHL (on Alternate No. 1), BHIJFM (on Alternate No. 2), BCGEFM (on Alternate No. 3), and BCDEFM (on Alternate No. 4).

Grazing land is on the north and grazing and cropland is on the south of segment KLJFM (on Alternate No. 1). Irrigated land is mainly to the south of Alternate No. 1 (See exhibit D, Irrigation and Drainage Map.)

TERRAIN

The land along segment AB (all alternates) and along segment HKLJFM (Alternate No. 1) is relatively flat ground located along the Musselshell River Valley. Between points L and M on Alternate No. 1 is a stretch of high rock cliffs on the north side of the present highway. Between points B and F, Alternates No. 2,3, and 4 are located in rolling sagebrush - covered prairie with few trees and occasional small peaks.

SERVICE TO THE AREA

Alternate No. 1 would provide the best service to the immediate area as those families living along the present highway would have about the same access as they do now. All the other alternates would be less suited to providing service to the residents along the present highway and would be principally for the benefit of the through travelers.

III. PUBLIC HEARING COMMENTS

In accordance with Section 116 of the Federal Aid Highway Act of 1956 and the U.S. Department of Transportation's Policy and Procedure Memorandum 20-8, a Corridor Public Hearing was held in the Courtroom of the Golden Valley County Courthouse at Ryegate, Montana on Monday, July 19, 1971, at 7:30 P.M.. The route location of a proposed highway construction project from a point just east of Ryegate, Montana on U.S. 12 to a point approximately four miles west of Lavina, Montana was presented. The four alternate routes were discussed. It appeared that the majority of those present endorsed Alternate No. 1. Alternates No. 2,3, and 4 received criticism due to the adverse effect these alternates would have on grazing in the area. It was also testified that Alternate No. 1 would provide the best service to the local residents and would be the better route for truckers.

IV. RELATED STUDIES AND REPORTS

PRELIMINARY COST ESTIMATES

COST ANALYSIS

PURPOSE

The Purpose of this cost analysis is to compare the construction, maintenance, and operating costs of the various alternates.

RESULTS

TOTAL CONSTRUCTION COSTS

Alternate Number (Segment BM)	Total Construction Cost ($1,000)
1	1,432
2	1,657
3	1,402
4	1,242

ANNUAL COSTS

Alternate No. (Segment BM)	Annual Const. Cost (1,000)	Annual Maintenance Cost ($1,000)	Average Annual Operating Cost ($1,000)	Annual Const. + Maint. + Ave. Annual Oper. Cost ($1,000)
1	97	9	787	893
2	107	14	773	894
3	94	16	794	904
4	83	16	795	894

DISCUSSION OF RESULTS

Construction Cost

Alternate No. 2 is highest in construction cost, Alternate No. 1 second highest, Alternate No. 3 third, and Alternate No. 4 fourth.

The construction cost for Alternate No. 1 includes the high cost of reconstruction of the railroad overpass, about $66,000 more than Alternate No. 2 and about $275,000 more than the other two alternates. Total annual cost estimates, however, show Alternate No. 1 to be more beneficial economically than it appears at first observation.

Maintenance Cost

Alternate No. 1 is lowest in maintenance cost and Alternates 2,3, and 4 are similar as all the other alternate's maintenance costs include the cost of maintaining the P.T.W..

Operating Cost

Alternate No. 2 is lowest in operating cost, Alternate No. 1 is next lowest, followed by Alternates No. 3 and 4. Alternate No. 1 is the longest of the four routes which contributes to the higher operating costs.

Total Annual Construction plus Maintenance plus Operating Cost

Alternate No. 1 is lowest in total annual construction plus maintenance plus operating cost, Alternate No. 2 second, Alternate No. 4 third, and Alternate No. 3 is highest.

Assumptions

As segment AB is common to all the alternates considered, the costs shown are for that portion of the alternates from point B to point M only.

DERIVATION OF COSTS

Average unit costs were taken from the 1970 Montana Highway Commission's average bid price list.

Grading - The alternates were plotted on a contour map of the area under study. Average end areas were used to calculate cut and fill quantities. Subexcavation quantities are included in the grading quantities.

Base and Surfacing - Average unit costs for plant mix, top surface and crushed base were taken from the above mentioned list.

Drainage - Average cost per foot for 24 inch CSP culvert was used. An average culvert length was determined for each alternate. The lengths varied from 124 feet for Alternate No. 4 to 212 feet for Alternate No. 1.

Culvert Excavation - An estimate of 15 Cubic yards for Alternates No. 2,3, and 4 and 50 cubic yards for Alternate No. 1 (includes removal and replacement of old culvert) were used.

Signing - An average cost of $500 per mile was used.

Guard Rail - Fills 15 feet or more in length were guardrailed for their entire length plus 175 feet.

Erosion Control - Estimates include costs of seeding, concrete chutes and other erosion control devices.

Structures - Costs were determined from previous estimates on similar structures.

Fencing - An average cost per mile was used.

Right-Of-Way - An average cost per acre in a similar area was used for the right-of-way estimate.

ITEMIZED COST ESTIMATES

CONSTRUCTION COST

ALTERNATE NO. 1, SEGMENT BM

Item	Unit	Unit Cost	Quantity	Subtotal ($)	Total ($)
Grading	Cu. Yd.	.55	431,874	237,530	
Plant Mix	Ton	4.00	24,823	99,294	
Top Surface Type "A"	Ton	1.44	23,083	33,240	
Crse. Base A Gr. 5	Ton	1.08	206,787	223,330	
Plant Mix Oil	Ton	30.00	1,603	48,090	
Prime	Ton	43.00	274	11,816	
Tack	Gal.	.19	21,251	4,038	657,338
Drainage	Ft.	9.82	8,480	83,273	
Culvert Excavation	Cu. Yd.	2.98	2,000	5,960	
Signing	Mi.	500	8.62	4,310	
Guard Rail	Ft.	5.00	5,500	27,500	
Erosion Control	Mi.	3,700	8.62	31,894	
Structures (R/R Underpass)				395,776	
Fencing	Mi.	2,883	8.6742	25,008	573,721
Subtotal Const. Cost					1,231,059
Engineering & Contingencies 15%					184,658
Right-of-Way					16,709
				Total Construction Cost	1,432,426

CONSTRUCTION COST

ALTERNATE NO. 2, SEGMENT BM

Item	Unit	Unit Cost	Quantity	Subtotal ($)	Total ($)
Grading		.55	844,478	464,462	
Plant Mix	Ton	4.00	23,848	95,392	
Top Surface Type "A"	Ton	1.44	22,176	31,933	
Crse. Base A Gr. 5	Ton	1.08	198,660	214,552	
Plant Mix Oil	Ton	30.00	1,540	46,200	
Prime	Ton	43.00	264	11,352	
Tack	Gal.	.19	20,416	3,879	867,770
Drainage	Ft.	9.82	6,200	60,884	
Culvert Excavation	Cu. Yd.	2.98	600	1,788	
Signing	Mi.	500	8.50	4,250	
Guard Rail	Ft.	5.00	21,730	108,650	
Erosion Control	Mi.	3700	8.50	31,450	
Structures (R/R Overpass)				320,000	
Fencing	Mi.	2,883	8.333	24,024	551,046
Subtotal Construction Cost					1,418,816
Engineering and Contingencies 15%					212,822
Right-of-Way					24,937
			Total Construction Cost		1,656,575

CONSTRUCTION COST

ALTERNATE NO. 3, SEGMENT BM

Item	Unit	Unit Cost	Quantity	Subtotal ($)	Total ($)
Grading	Cu.Yd.	.55	867,922	477,357	
Plant Mix	Ton	4.00	24,281	97,126	
Top Surface Type "A"	Ton	1.44	22,579	32,514	
Crse. Base A Gr. 5	Ton	1.08	202,272	218,453	
Plant Mix Oil	Ton	30.00	1,568	47,040	
Prime	Ton	43.00	268	11,558	
Tack	Gal.	.19	20,787	3,949	887,997
Drainage	Ft.	9.82	6,210	60,982	
Culvert Exc.	Cu.Yd.	2.98	675	2,012	
Signing	Mi.	500	8.54	4,270	
Guard	Ft.	5.00	12,230	61,150	
Erosion Control	Mi.	3700	8.54	31,598	
Structures (R/R Overpass)				122,670.00	
Fencing	Mi.	2,883	8.4848	24,461.68	307,143
Subtotal Construction Cost					1,195,140
Engineering and Contingencies 15%					179,271
Right-of-Way					27,769
			Total Construction Cost		1,402,180

CONSTRUCTION COST

ALTERNATE NO. 4, SEGMENT BM

Item	Unit	Unit Cost	Quantity	Subtotal($)	Total($)
Grading	Cu.Yd.	.55	633,046	348,175	
Plant Mix	Ton	4.00	24,390	97,560	
Top Surface Type "A"	Ton	1.44	22,680	32,659	
Crse. Base A Gr. 5	Ton	1.08	203,175	219,429	
Plant Mix Oil	Ton	30.00	1,575	47,250	
Prime	Ton	43.00	270	11,610	756,683
Tack	Gal.	.19	20,880	3,967	
Drainage	Ft.	9.82	5,580	54,795	
Culvert Excavation	Cu.Yd.	2.98	675	2,012	
Signing	Mi.	500	8.56	4,280	
Guard Rail	Ft.	5.00	13,730	68,650	
Erosion Control	Mi.	3700	8.56	31,672	
Structures (R/R Overpass				112,883	
Fencing	Mi.	2,883	8.5227	24,570	298,862
Construction					1,055,545
Engineering & Contingencies 15%					158,331
Right-of-Way					27,893
			Total Construction Cost		1,241,769

ANNUAL CONSTRUCTION COST

ALTERNATE NO. 1, SEGMENT BM

Item	Total Cost ($)	Life (yrs.)	($) Annual Cost
Grade	237,530	40	15,796
Drainage	83,273	40	5,537
Base & Surface	419,808	20	36,607
Fencing	25,008	50	1,586
Structures	395,776	50	25,092
Engineering & Contingencies	184,658	50	11,707
Right-of-Way	16,709	50	1,059
		Total Annual Cost	$97,384

ANNUAL CONSTRUCTION COST

ALTERNATE NO. 2, SEGMENT BM

Item	Total Cost ($)	Life (yrs.)	($) Annual Cost
Grade	464,462	40	30,887
Drainage	60,884	40	4,048
Base & Surface	403,309	20	35,169
Fencing	24,025	50	1,523
Structures	320,000	50	20,288
Engineering & Contingencies	212,822	50	13,492
Right-of-Way	24,937	50	1,581
		Total Annual Cost	$106,928

ANNUAL CONSTRUCTION COST

ALTERNATE NO. 3, SEGMENT BM

Item	Total Cost ($)	Life (yrs.)	Annual Cost ($)
Grade	477,357	40	$ 31,744
Drainage	60,982	40	4,055
Base and Surface	410,642	20	35,808
Fencing	24,462	50	1,551
Structures	122,670	50	7,777
Engr. & Conting.	179,271	50	11,365
Right of Way	27,769	50	1,761
		Total Annual Cost	$ 94,061

ANNUAL CONSTRUCTION COST

ALTERNATE NO. 4, SEGMENT BM

Item	Total Cost ($)	Life (Yrs.)	Annual Cost ($)
Grade	348,175	40	23,154
Drainage	54,795	40	3,643
Base and Surface	412,475	20	35,968
Fencing	24,571	50	1,558
Structures	112,883	50	7,157
Engr. & Conting.	158,331	50	10,038
Right of Way	27,893	50	1,768
		Total Annual Cost	$ 83,286

ANNUAL MAINTENANCE COSTS

Alternate No. (Segment BM)	Type of Facility	Miles to Maintain	Annual Cost per mile($)		Annual Cost($)
1	40' bit.surf. road	8.6742	1,000	Total	$8,674
2	40' bit. surf. road	8.33	1,000		8,330
	Present Highway	6.00	900		5,400
				Total	$13,730
3	40' bit. surf. road	8.484	1,000		8,485
	Present Highway	8.6742	900		7,807
				Total	$16,292
4	40' Bit. surf. road	8.5227	1,000		8,523
	Present Highway	8.6742	900		7,807
				Total	$16,330

OPERATING COSTS

TRAFFIC DATA

1. Average Daily Traffic

   1974 = 1105 Vehicles/Day
   1994 = 2200 Vehicles/Day

   20 year Average = 1653 Vehicles/Day

2. Percent of Vehicle Use

   Commercial Truck 21.9%
   Pickup Truck 15.7%) -- 78.1%
   Automobile 62.4%)

Since this road will, after being built, provide 2-lane, rural-type travel, use cost figures for rural 2-lane, normal operation.

Cars & Pickups		Trucks (15,000#)	
% Grade	Oper. Cost/mi.	% Grade	Oper. Cost/mi.
0-1	$.1022	0-1	$.2850
1-2	.1022	1-2	.2856
2-3	.1023	2-3	.3004
3-4	.1029	3-4	.3349
4-5	.1040	4-5	.3811

ALTERNATE NO. 1 - Calc. of Operating Costs

GRADE	L LENGTH (MI.)	Average Daily Traffic CARS	Average Daily Traffic TRUCKS	Annual Vehicle Miles L x ADT x 365 CARS	Annual Vehicle Miles L x ADT x 365 TRUCKS	COST/MILE($) CARS	COST/MILE($) TRUCKS	Annual Operating Cost TOTAL($) CARS	Annual Operating Cost TOTAL($) TRUCKS
0 - 1%	7.62	1291		3,590,505		.1022		366,950	
			362		1,006,700		.2850		286,901
1 - 2%	0	1291		0		.1022		0	
			362		0		.2856		0
2 - 3%	.55	1291		259,150		.1023		26,511	
			362		72,635		.3004		21,820
3 - 4%	.91	1291		428,875		.1029		44,131	
			362		120,085		.3349		40,216
4 - 5%	0	1291		0		.1040		0	
			362		0		.3811		0
	9.08					SUBTOTAL		$437,592	$348,937
						TOTAL		$786,529	

ALTERNATE NO. 2 - Calc. of Operating Costs

GRADE	L Length (MI.)	Average Daily Traffic		Annual Vehicle Miles L x ADT x 365		COST/MILE($)		Annual Operating Cost TOTAL($)	
		CARS	TRUCKS	CARS	TRUCKS	CARS	TRUCKS	CARS	TRUCKS
0 - 1%	4.46	1291		2,101,670		.1022		214,791	
			362		589,475		.2850		168,000
1 - 2%	1.70	1291		801,175		.1022		81,880	
			362		224,475		.2856		64,110
2 - 3%	.49	1291		231,045		.1023		23,621	
			362		64,605		.3004		19,407
3 - 4%	1.28	1291		602,980		.1029		62,041	
			362		168,995		.3349		56,596
4 - 5%	.83	1291		391,280		.1040		40,693	
			362		109,500		.3811		41,730
	8.76					SUBTOTAL		$423,032	$349,843
						TOTAL		$772,875	

ALTERNATE NO. 3 - Calc. of Operating Costs

GRADE	L LENGTH (MI.)	Average Daily Traffic		Annual Vehicle Miles L x ADT x 365		Cost/Mile ($)		Annual Operating Cost TOTAL ($)	
		CARS	TRUCKS	CARS	TRUCKS	CARS	TRUCKS	CARS	TRUCKS
0 - 1%	4.13	1291		1,946,118		.1022		198,893	
			362		545,697		.2850		155,524
1 - 2%	1.54	1291		725,671		.1022		74,164	
			362		203,480		.2856		58,114
2 - 3%	.98	1291		461,791		.1023		47,241	
			362		129,487		.3004		38,898
3 - 4%	1.66	1291		782,217		.1029		80,490	
			362		219,336		.3349		73,456
4 - 5%	.68	1291		320,426		.1040		33,324	
			362		89,848		.3811		34,241
	8.98					SUBTOTAL		$434,112	$360,233
						TOTAL		$794,345	

ALTERNATE NO. 4 - Calc of Operating Costs

GRADE	L LENGTH (MI.)	Annual Daily Traffic CARS	Annual Daily Traffic TRUCKS	Annual vehicle Miles L x ADT x 365 CARS	Annual vehicle Miles L x ADT x 365 TRUCKS	COST/MILE ($) CARS	COST/MILE ($) TRUCKS	Annual Operating Cost TOTAL ($) CARS	Annual Operating Cost TOTAL ($) TRUCKS
0 - 1%	3.61	1291		1,701,086		.1022		173,851	
			362		476,989		.2850		135,942
1 - 2%	1.85	1291		871,748		.1022		89,093	
			362		244,441		.2856		69,812
2 - 3%	2.12	1291		998,976		.1023		102,195	
			362		280,116		.3004		84,147
3 - 4%	.31	1291		146,077		.1029		15,032	
			362		40,960		.3349		13,718
4 - 5%	1.12	1291		527,760		.1040		54,887	
			362		147,986		.3811		56,397
						SUBTOTAL		$435,058	$360,016
	9.01					TOTAL		$795,074	

V. EXHIBITS

EXHIBIT A

LOCATION MAPS

EXHIBIT B

MAP OF ALTERNATES

EXHIBIT C

PLAN AND PROFILES

OF

ALTERNATES

LEGEND

EXISTING FEATURES

PAVED ROAD

TRAIL

BRIDGE

STREAM

INTERMITTENT STREAM

IRRIGATION DITCH

DEPRESSION

RAILROAD

RAILROAD UNDERPASS

SPOT ELEVATION X 3196

BUILDINGS

RESERVOIR

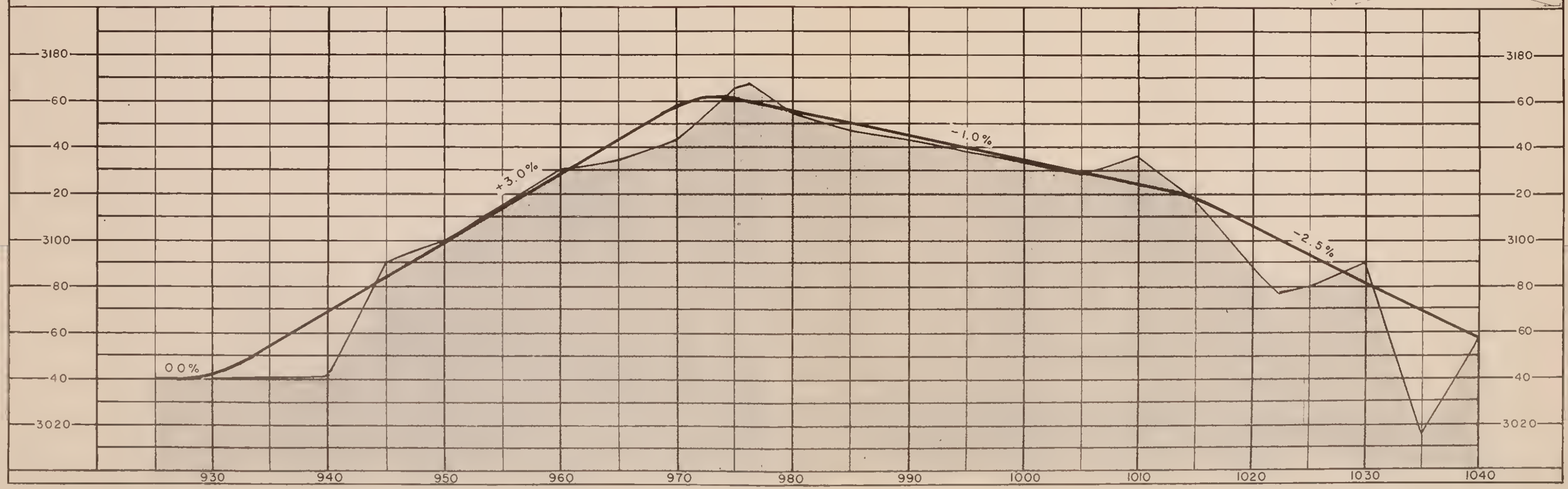
PROPOSED FEATURES

NEW HIGHWAY

RAILROAD OVERPASS

RAILROAD UNDERPASS

RYEGATE - EAST
PLAN & PROFILE
ALTERNATE 1
STA. 925 TO STA. 1060



RYEGATE - EAST
PLAN & PROFILE
ALTERNATE 1
STA. 1020 TO STA. 1160

RYEGATE - EAST
PLAN & PROFILE
ALTERNATE 1
STA. 1145 TO STA. 1281

ALTERNATE 2

NINE MILE CREEK

BURLINGTON NORTHERN RAILROAD

C.M.ST.P.P. RY.

MUSSELSHELL RIVER

SCALE

HORIZONTAL 0 200 400 800 FEET

VERTICAL 0 10 20 40 FEET

-0.2%

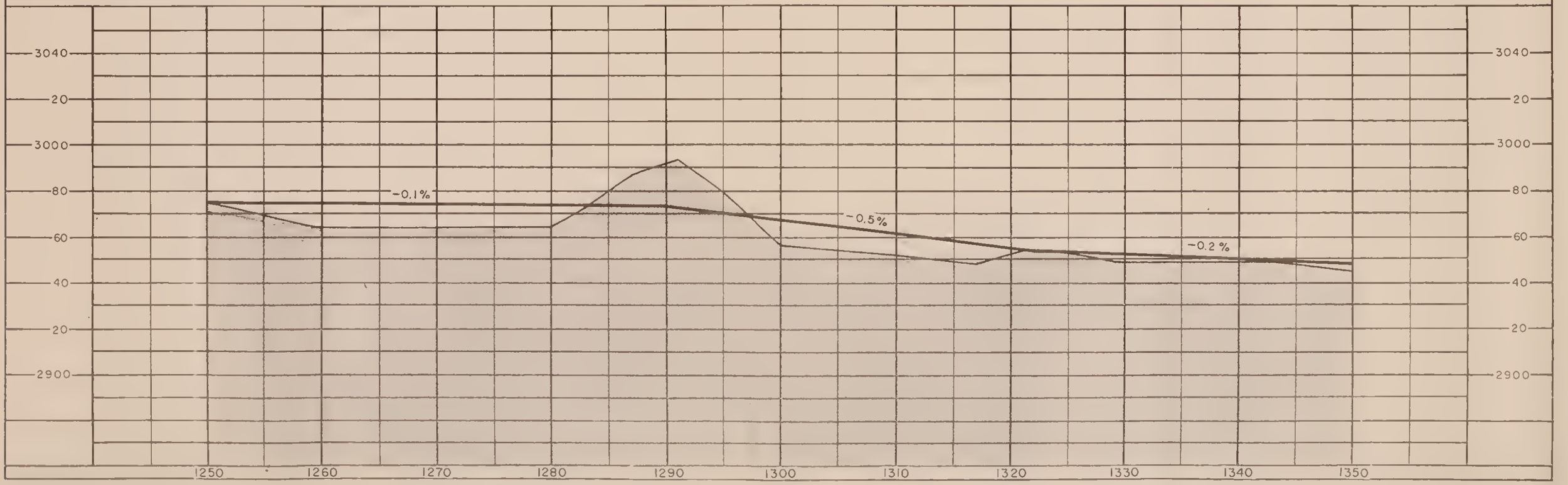
-0.1%

BURLINGTON NORTHERN RAILROAD

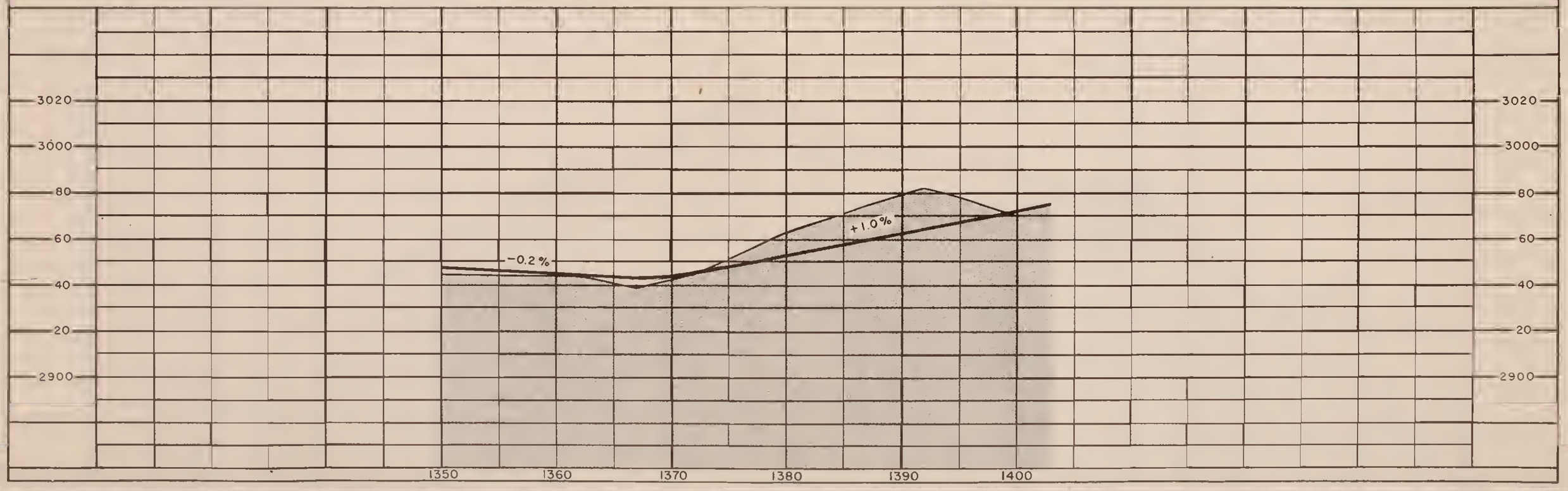
3100
80
60
40
20
3000
80
60
2940

1150 1160 1170 1180 1190 1200 1210 1220 1230 1240 1250 1260 1270 1280

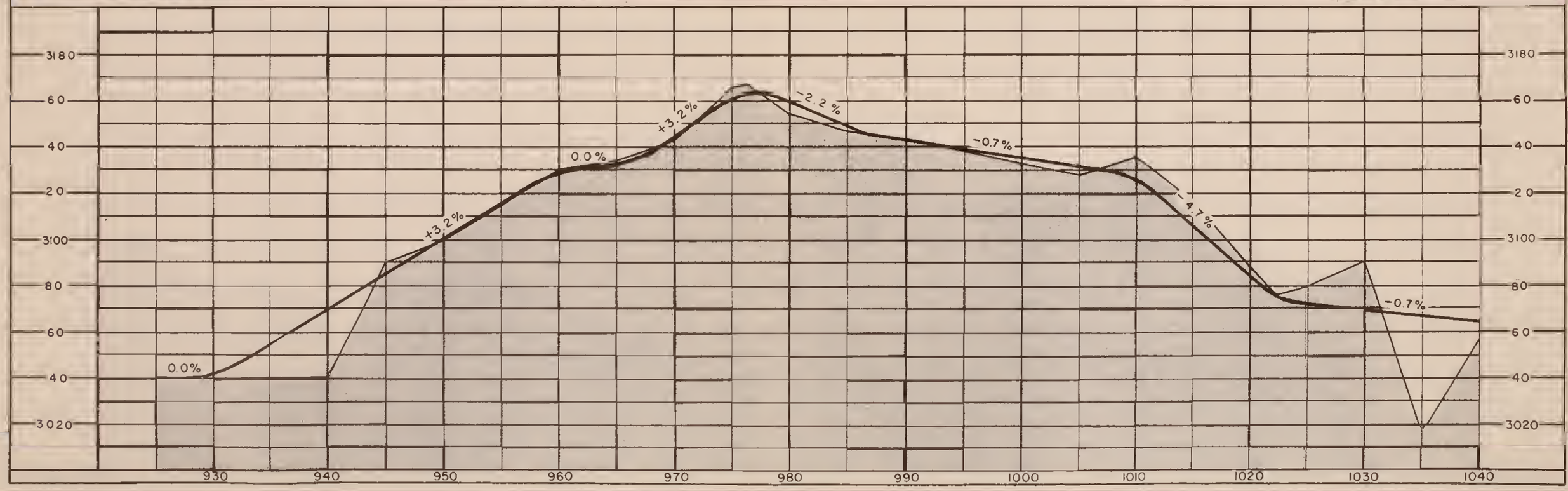
RYEGATE - EAST
PLAN & PROFILE
ALTERNATE 1
STA. 1243 TO STA. 1382



RYEGATE - EAST
PLAN & PROFILE
ALTERNATE 1
STA. 1304 TO STA. 1403



RYEGATE - EAST
PLAN & PROFILE
ALTERNATE 2
STA. 925 TO STA. 1058



RYEGATE - EAST
PLAN & PROFILE
ALTERNATE 2
STA. 1023 TO STA. 1158

MUSSELSHELL RIVER

U.S. 12

C.M.ST.P.P. RY.

ALTERNATE 1

SCALE
HORIZONTAL 0 200 400 800 FEET
VERTICAL 0 10 20 40 FEET

-0.7%
+0.5%
-2.0%
+5.0%
-0.7%
-1.5%

3160
40
20
3100
80
60
40
20
3000

1040 1050 1060 1070 1080 1090 1100 1110 1120 1130 1140 1150

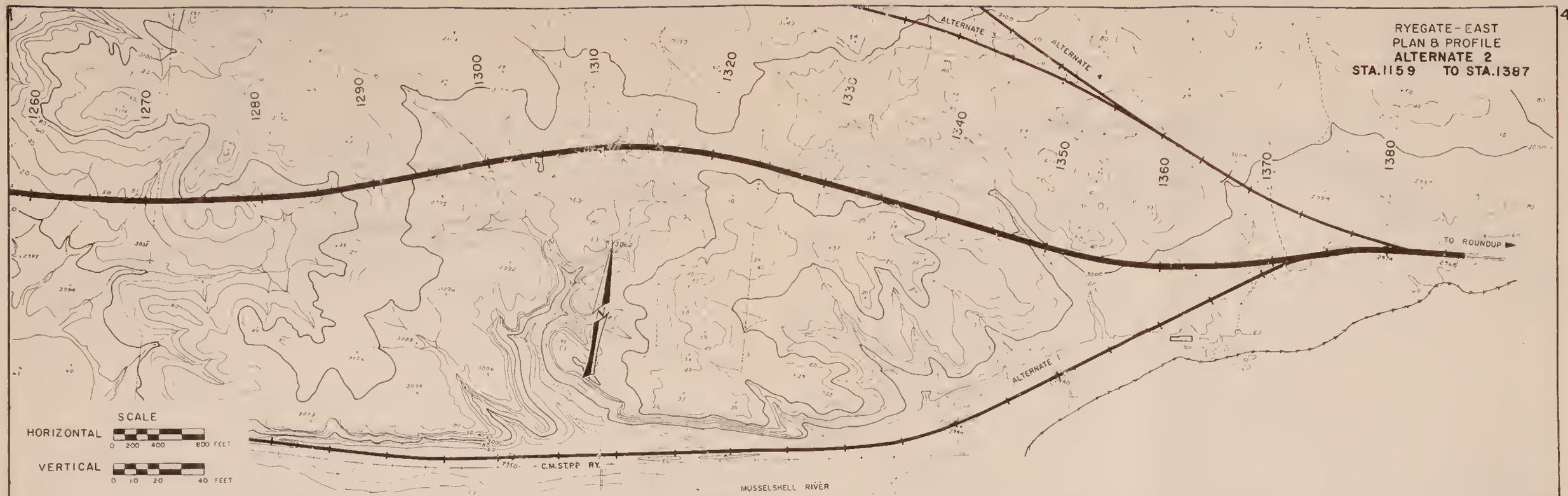
RYEGATE - EAST
PLAN & PROFILE
ALTERNATE 2
STA. 1137 TO STA. 1272

SCALE
HORIZONTAL 0 200 400 800 FEET
VERTICAL 0 10 20 40 FEET

NINE MILE CREEK
BURLINGTON NORTHERN RAILROAD
ALTERNATE 1
C.M.ST.P.P. RY.
MUSSELSHELL RIVER

-1.5%
+0.7%
-3.0%
-0.5%
+0.6%
-1.0%
+3.5%

RYEGATE - EAST
PLAN & PROFILE
ALTERNATE 2
STA. 1159 TO STA. 1387



RYEGATE - EAST
PLAN & PROFILE
ALTERNATE 3
STA. 925 TO STA. 1059

CARELESS CREEK
U.S. 12
TO RYEGATE
ALTERNATES 1&2

SCALE
HORIZONTAL 0 200 400 800 FEET
VERTICAL 0 10 20 40 FEET

+4.5%
0.0%
+1.9%
-2.7%
+0.5%
+4.0%

3220
3200
80
60
40
20
3100
80
60
3040

930 940 950 960 970 980 990 1000 1010 1020 1030 1040 1050

RYEGATE - EAST
PLAN & PROFILE
ALTERNATE 3
STA. 1046 TO STA. 1181

ALTERNATE 4

BURLINGTON NORTHERN RAILROAD

NINE MILE CREEK

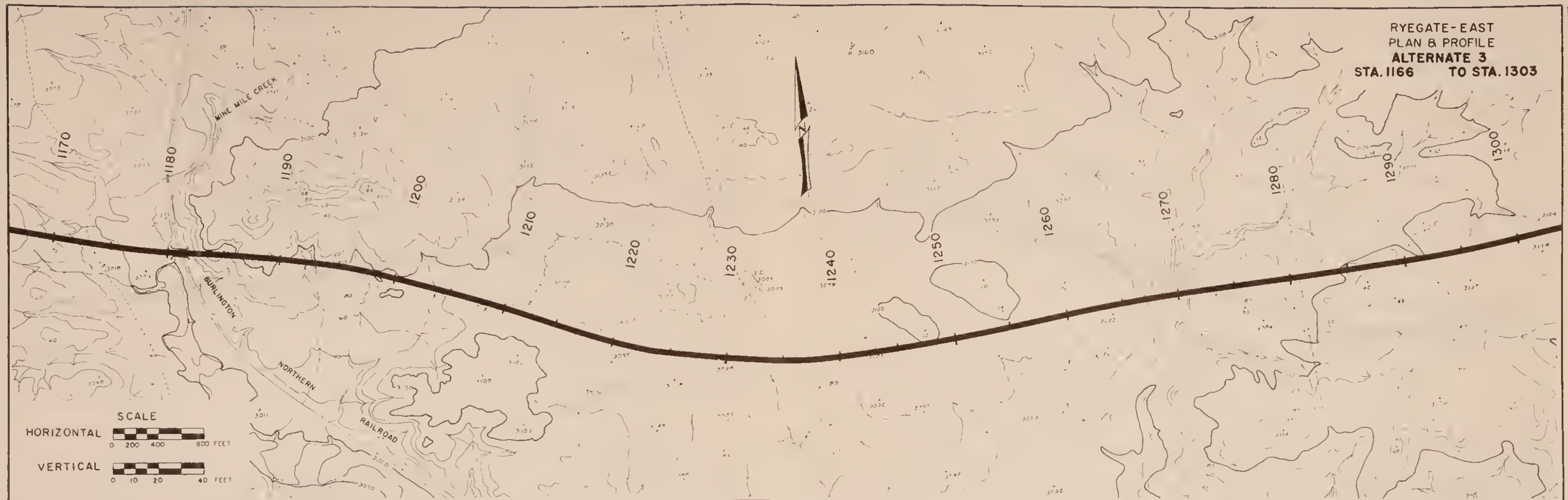
SCALE
HORIZONTAL 0 200 400 800 FEET
VERTICAL 0 10 20 40 FEET

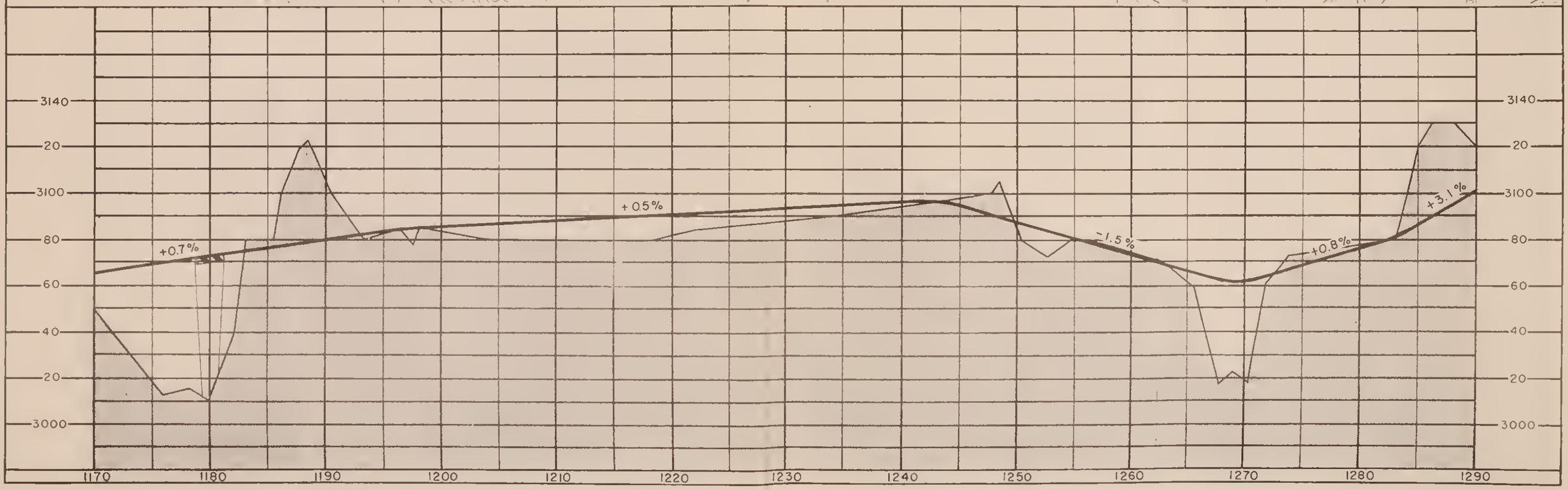
+4.0%
-2.0%
-0.5%
+3.0%
-5.0%
-1.9%
-4.5%
+0.7%

3220
3200
80
60
40
20
3100
80
3060

1050 1060 1070 1080 1090 1100 1110 1120 1130 1140 1150 1160 1170 1180

RYEGATE-EAST
PLAN & PROFILE
ALTERNATE 3
STA. 1166 TO STA. 1303





RYEGATE-EAST
PLAN & PROFILE
ALTERNATE 3
STA. 1270 TO STA. 1399

ALTERNATE 4

ALTERNATE 2

ALTERNATE 1

TO ROUNDUP

SCALE
HORIZONTAL 0 200 400 800 FEET
VERTICAL 0 10 20 40 FEET

+1.0%
−0.5%
+1.5%
+0.5%
−3.7%
−4.5%
−2.2%
−1.0%

3140
20
3100
80
60
40
20
3000
80
2960

1270 1280 1290 1300 1310 1320 1330 1340 1350 1360 1370 1380 1390 1400

RYEGATE - EAST
PLAN & PROFILE
ALTERNATE 4
STA. 925 TO STA. 1059

CARELESS CREEK

TO RYEGATE

ALTERNATES 1&2

SCALE
HORIZONTAL 0 200 400 800 FEET
VERTICAL 0 10 20 40 FEET

0.0%
+4.5%
0.0%
+1.9%
-2.7%
+0.5%
+4.0%

20
3200
80
60
40
20
3100
80
60
40

930 940 950 960 970 980 990 1000 1010 1020 1030 1040

RYEGATE-EAST
PLAN & PROFILE
ALTERNATE 4
STA. 1040 TO STA. 1177

1050 1060 1070 1080 1090 1100 1110 1120 1130 1140 1150 1160 1170

ALTERNATE 3

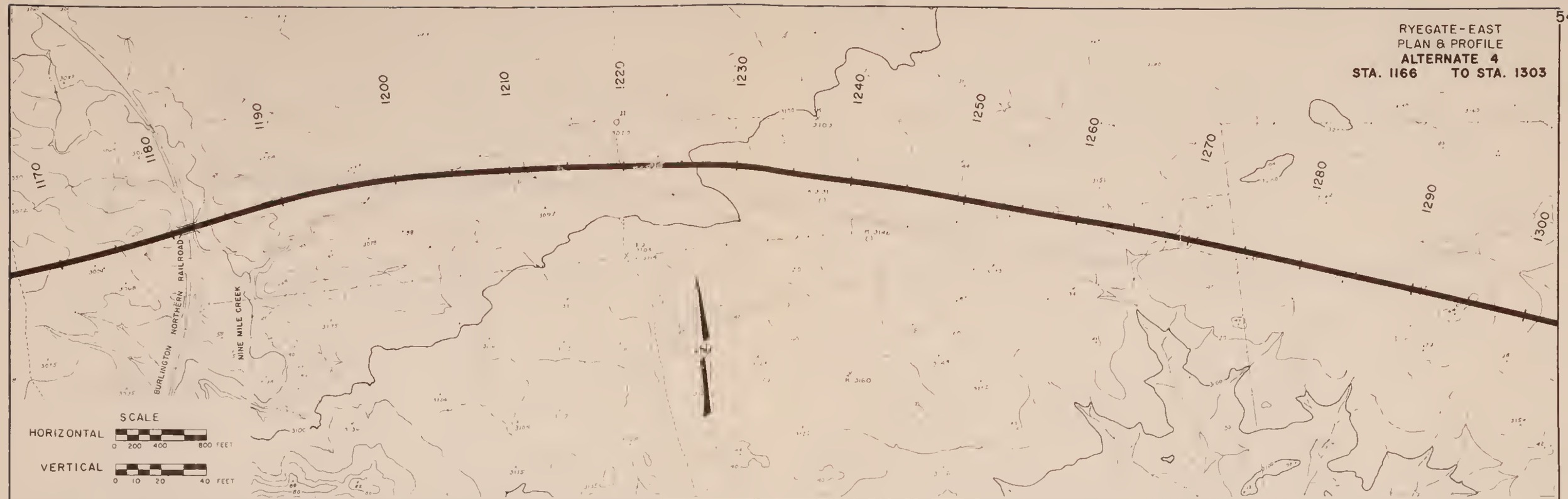
SCALE
HORIZONTAL 0 200 400 800 FEET
VERTICAL 0 10 20 40 FEET

+4.0%
-0.2%
-0.5%
-2.5%

3220
3200
80
60
40
20
3100
80
3060

1040 1050 1060 1070 1080 1090 1100 1110 1120 1130 1140 1150 1160

RYEGATE - EAST
PLAN & PROFILE
ALTERNATE 4
STA. 1166 TO STA. 1303



RYEGATE - EAST
PLAN & PROFILE
ALTERNATE 4
STA. 1270 TO STA. 1400

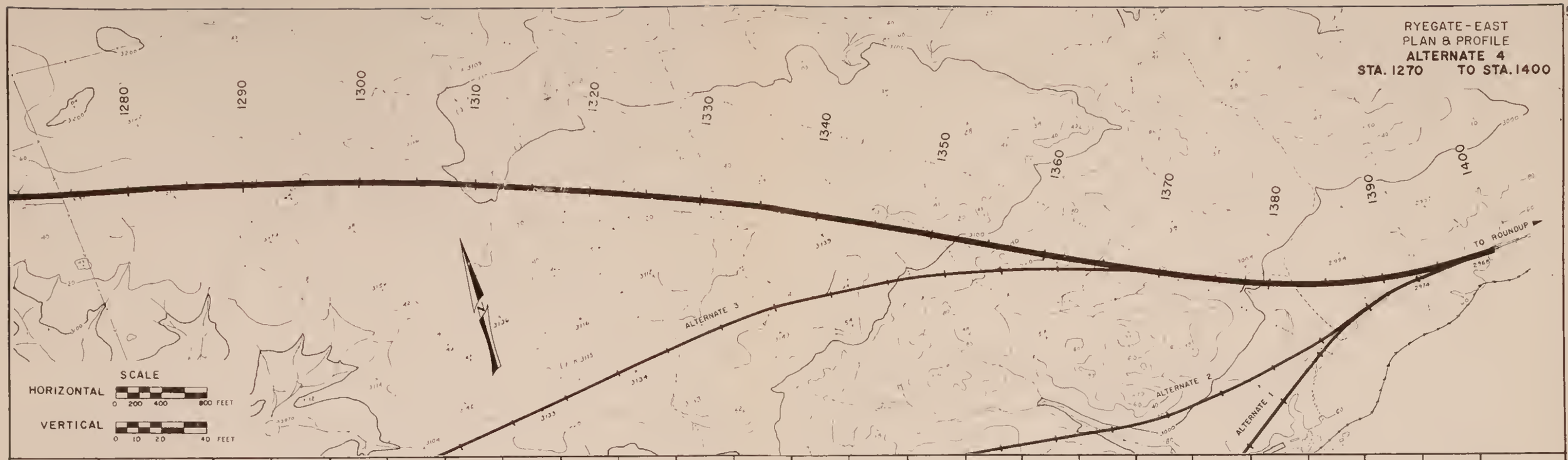


EXHIBIT D

IRRIGATION & DRAINAGE MAP

RYEGATE - EAST